

Nanocladius (N.) Kieffer from Africa south of the Sahara, with two new species and key

(Insecta, Diptera, Chironomidae, Orthoclaadiinae)

By A. D. Harrison

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Seven species of *Nanocladius* (*Nanocladius*) are recognized from Africa south of the Sahara. Males and females of *N. (N.) vitellinus* Kieffer, type species of the genus, are described in detail. Two new species are described: *argentiplumus* - males and females; and *saetheri* - male, female, pupa and larva. Females of Lehmann's *jannae* and *ortsi*, and the male of his *acutus* are described in detail. The taxonomic value of male und female antennae is emphasized.

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Introduction

Freeman (1953) describes a species of *Nanocladius*, under the name *Eukiefferiella* (*Microcricotopus*) *niveipluma*, from the Great Berg River, Western Cape Province, South Africa. This species is characterized by having white antennal plume setae, with very long, curved terminal setae towards the tip of the clubbed, last flagellomere. The AR is 0.3-0.4. The female also has very long curved terminal setae on the last flagellomere.

However, in 1956 Freeman was able to examine the female holotype of *N. vitellinus* Kieffer, 1913 in the Museum National d'Histoire Naturelle, Paris. He found that it has antennae similar to those of his *E. (M.) niveipluma* and concludes, therefore, that *niveipluma* must fall as a synonym.

Freeman's dropping of the species *E. (M.) niveipluma* is not based on the British Museum series labelled "*N. vitellinus* Kieffer", but on the Paris holotype, therefore Saether's 1977 re-establishment of *N. niveiplumus* on the basis of the BMNH series must fall. At least two other species of *Nanocladius* are in this BMNH collection.

Saether (1977) examined some of the BMNH series of "*N. vitellinus*", concluding correctly that *Nanocladius* Kieffer, 1913 is the senior synonym of the genus *Microcricotopus*.

Unfortunately, he could not have seen any true specimens of the species *N. vitellinus* with its characteristic very long terminal antennal setae. The specimen which he illustrates as "Freeman's ? *vitellinus*" is another species (called spec. A. in this paper).

Moreover, Freeman (personal communication 1960) sorted and identified 26 specimens collected by Dr. F. M. Chutter from the Vaal River, Transvaal. Three, two males and a female, he identified as *N. vitellinus* and the rest as the "so-called short plumed variety". He comments, "typically the last segment of the antenna of *vitellinus* is short (AR 0.3) with 8-12 long curled hairs, each nearly as long as the whole segment which carries a few plume hairs at base. The atypical specimens seem to differ in having a long last antennal segment (AR perhaps 0.75) which, in the male, carries many plume hairs and a greater number of much shorter hairs at the apex than in the type form". He was of the opinion that the atypical form should be treated as a separate species.

In this present paper *N. vitellinus* Kieffer, with its striking antennal structure, is described in more detail. The "atypical form" mentioned by Freeman in his personal communication (1960) is here described as a new species.

Freeman (1956) described only 2 species of *Nanocladius*, *N. vitellinus*, those with white antennal setae, and *N. brummeus* Freeman, those with dark or brown setae. Saether (1977) in his key to males also uses this antennal setal character for identification.

General features of the species of *Nanocladius* (*Nanocladius*) considered in this paper

All fall into the genus *Nacocladius* and the subgenus *Nanocladius*, both as defined by Saether (1977).

They fall into two groups, those with white or silvery antennal plumes, almost colourless in slide mounts, and those with brown antennal plumes, yellowish to brown in slide mounts. The former are found in the slower reaches of rivers and in lakes, the latter in the upper torrential zones of rivers.

Head. In males the structure of the last flagellomere, with its terminal setae, is characteristic and very useful taxonomically. This is less so in females but there are differences and the antennae of *N. vitellinus* are very distinctive.

Thorax. Females have one median antepronotal seta per side (Figs 1-2); males do not; though there may be signs of a rudiment. All have a light coloured patch in the centre of the scutum bearing two acrostichal setae, side by side (Fig. 9). In the white-plumed species these are rudimentary in males and very short in the females; in the brown-plumed species they are short in both sexes but rudimentary in the males of *N. acutus*.

Wings. All species have the costa extended beyond R_{4+5} in both sexes.

Legs. The males of the white-plumed species have the basal half of the femora of the mid and hind legs slightly darker than the distal half, but not the brown-plumed males. All females of the white-plumed species have sensillae chaeticae on tarsomere 1 of the mid leg (see also Saether 1977), but none was found on any males or on females of the brown-plumed species.

Abdomen. The setation of the abdominal tergites (Fittkau & Lehmann 1970) does appear to be a useful taxonomic character but cannot be used alone (Figs 3-8).

Hypopygium. All except *N. ortsii* have microtrichia on the tip of the anal point, all have distinct gonocoxal lobes, some more acute than others.

Female genitalia. In all, sternite VIII forms a floor under the anterior part of the vagina and all have 2 setigerous protrusions on tergite IX; gonopophysis VIII is divided widely into broadly triangular ventro-lateral lobes, each with a tuft of long microtrichia at the apex (shown on the right of the figures), narrow dorsomesal lobes and weak apodeme lobes (shown on the left of the figures). Gonocoxite IX more or less equal in size to the cerci. Seminal capsules are large with small necks ventrally, and ducts are convoluted or looped and glandular for their whole length with separate openings and no obvious bulbs in most. Segment X is normally developed, post genital plate small but distinct and cerci small, always much shorter than the seminal capsules.

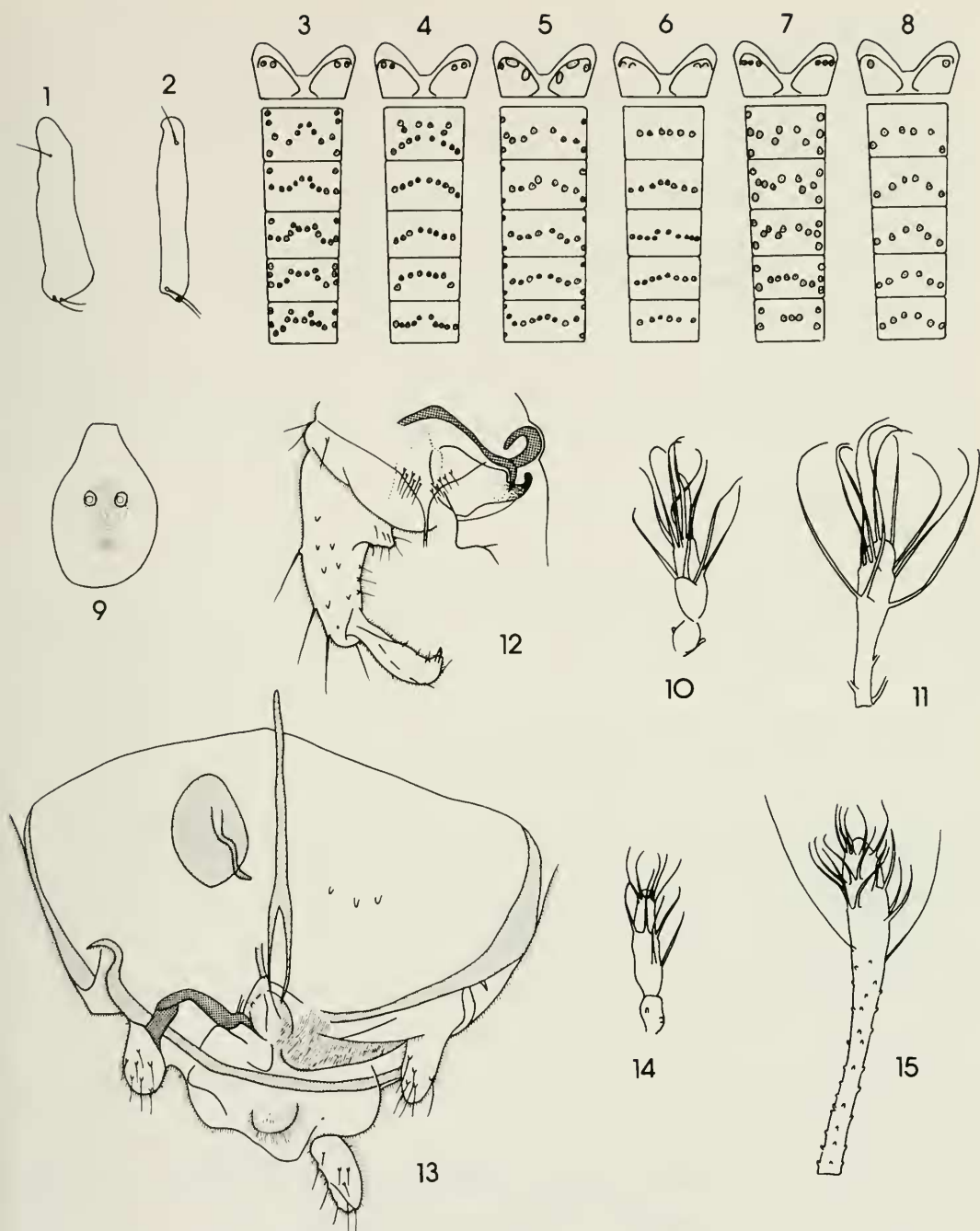
Methods

Specimens of the first two species had been on pins since 1960 and had to be mounted in Euparal. The wings were removed and mounted, then the rest of the specimen was removed from the pin into 10 % KOH and softened for about 12 hours at room temperature (20 °C), then washed in alcohol and mounted on the same slide as the wings. Specimens of the other species were preserved in 70 % alcohol and mounted in Canada balsam dissolved in cellosolve.

Station numbers (ET) refer to sampling sites described by Harrison & Hynes (1988).

Key to adult males

1. Antennal plume setae white, colourless when mounted 2.
- Antennal setae brown, yellow to brown when mounted 4.



Figs 1-2. Antipronotum. 1. *N. jannae*. 2. *N. saetheri*.
 Figs 3-8. Setation of abdominal tergites I, III-VII. 3. *N. vitellinus* ♂. 4. *N. vitellinus* ♀. 5. *N. argentiplumus* ♂.
 6. *N. argentiplumus* ♀. 7. *N. saetheri* ♂. 8. *N. saetheri* ♀.
 Fig. 9. Acrostichal setae of *N. saetheri*.
 Figs 10-13. *N. vitellinus*. 10. End flagellomere ♀. 11. End flagellomere ♂. 12. Hypopygium. 13. ♀ genitalia.
 Figs 14-15. *N. argentiplumus*. 14. Flagellomere ♀. 15. Flagellomere ♂.

2. Last flagellomere with long curved setae, as long as or longer than the flagellomere, very few normal plume setae on base (Fig. 11) *N. vitellinus*
- Last flagellomere with curved terminal setae shorter than flagellomere, many normal plume setae on base 3.
3. Longest terminal setae 0.2 times length of flagellomere (Fig. 15) *N. argentiplus*
- Longest terminal setae at least 0.4 times length of flagellomere (Fig. 19) *N. saetheri*
4. Terminal setae 1.5 times length of last flagellomere which has 3 or 4 normal plume setae at base (Fig. 34) *N. acutus*
- Longest terminal seta only slightly longer, or clearly shorter than last flagellomere 5.
5. Longest terminal seta slightly longer, or subequal to last flagellomere, which has one normal plume seta at base (Fig. 31) *N. jannae* (*N. brunneus*?)
- All terminal setae clearly shorter than last antennomere which has at least 6 normal plume setae at base (Fig. 33) *N. ortsi*

Note: The male of *N. spec.* A is unknown.

Key to adult females

1. Antennae with 4 flagellomeres *N. spec.* A
- Antennae with 5 flagellomeres 2.
2. Antennal setae white, colourless when mounted 3.
- Antennal setae brown, yellow to brown when mounted 5.
3. Last flagellomere with longest seta 1.6 times its length (Fig. 10) *N. vitellinus*
- Setae on last flagellomere shorter than its length 4.
4. Abdominal tergites IV to VI with 3 setae per side (Fig. 8) *N. saetheri*
- Abdominal tergites IV to VI with at least 4 setae per side (Fig. 6) *N. argentiplus*
5. Penultimate flagellomere with 2 thin setae (Fig. 30), 3 dorsocentral setae *N. jannae* (*N. brunneus*?)
- Penultimate flagellomere with 4 robust setae (Fig. 32), 7 dorsocentral setae *N. ortsi*

Note. The Female of *N. acutus* is unknown but as the male has only 3 dorsocentrals the female may be similar to that of *N. jannae* in this respect.

Group A: Species with white antennal setae in males and females

Nanocladius (*Nanocladius*) *vitellinus* Kieffer

Eukiefferiella (*Microcricotopus*) *niveipluma* Freeman, 1953; *Nanocladius vitellinus*, Freeman 1956; Freeman & Cranston 1980.

This description is based on two males and one female, all originally pinned, and is an amplification of Freeman's (1956) description.

Adult male (N = 2)

Wing length. 1.19-1.62 mm.

Colour. Head mostly brown, antennae light, setae shiny white on pinned specimens, light, yellow to almost colourless in mounted specimens. Thorax dark brown; legs brown, basal half of femora of mid and hind legs darker. Abdomen mostly dark brown but anal half of tergites VI and VII lighter. Hypopygium brown.

Head. AR 0.37 and 0.38, antennae with 13 flagellomeres, the end one club-shaped with about 10 very long and curved terminal setae, a few normal plume setae on the base (Fig. 11), as long as or longer than the flagellomere, a few normal setae at the base of the antennomere. Setation: Outer verticals 1, inner verticals nil, clypeals 6; vestigial ocelli present. Palp segments: 20, 46, 58, 74, 115 μ m.

Thorax. Setation: Lateral anteprenotals 4, dorsocentrals 6-7, acrosticals nil, prealars 1 or 2, scutellars 1 or 2 per side.

Wings. Setation: Brachiolium 1, R₂, R₁ nil, R₄₊₅ nil, squama 6.

Legs. LR fore 0.57, mid 0.40, hind 0.47. No sensillae chaeticae.

Abdomen. Setal pattern Fig. 3.

Hypopygium (Fig. 12): Tergite IX has 8 or 12 setae and lateral tergite IX 3 setae; the anal point has 2 small microtrichia at the tip.

Adult female (N = 1)

Wing length. 1.5 mm.

Colour. Lighter than male. Head light brown, antennae light brown, setae white. Thorax yellowish, scutal stripes brown and separate, scutellum, postnotum and preepisternum brown; legs brown, basal half of femora of mid and hind legs slightly darker. Abdomen light brown but sternite VIII and posterior edge of tergite IX darker brown.

Head. AR 0.44, 5 flagellomeres. Setation: Outer verticals 1, inner verticals nil, clypeals 8. Vestigial ocelli present. Palp segments: 34, 46, 64, 104, 184 μ m.

Thorax. Setation: Anteprenotals 6, dorsocentrals 9, acrosticals nil, prealars 2, scutellum 2 per side.

Wings. Setation: Brachiolium 1, R 11, R₁ 2, R₄₊₅ 1, squama 7.

Legs. LR fore 0.55, mid 0.44, hind 0.51. Sensillae chaeticae about 5 on the basal 0.25 of tarsomere 1 of the mid leg.

Abdomen. Tergite setation in Fig. 4.

Genitalia (Fig. 13). Ventrolateral lobes with very long microtrichia medially, dorsomedial lobe present, apodeme lobe weak; coxosternapodeme strongly developed and dark; genocoxapodeme large and curved; setigerous protrusions of tergite of IX with 6 setae each (not in figure): Just proximal to these the tergite is strengthened by a strongly chitinated transverse bar (in figure); gonocoxite IX with about 10 setae; postgenital plate rounded, cerci small, 50 μ m, 0.73 of length of seminal capsule. Seminal capsule oval and brown with small funnel-shaped neck; (the capsules and ducts became badly displaced during the softening with KOH and the shape of the ducts could not be properly determined but they seem to be convoluted and glandular for their full length, ending separately with no obvious bulbs).

Specimens examined. 1♂, 1♀ from the Vaal River at Standerton, 30° 03'E, 26° 17'S; 1♂ from Kafferspruit, 29° 51'E, 26° 37'S, both in the Transvaal, S. Africa; coll. F. M. Chutter.

Comments. The long terminal antennal setae of both males and females can be discerned at magnifications as low as 10 $\times$, making them easy to sort from other species with white antennal setae.

Ecology. The specimens examined came from a section of the Vaal and a similar river where occasional torrents alternate with slow-flowing reaches. The type series of *niveipluma* came from a similar zone of the Great Berg River, Western Cape, South Africa, see also Scott 1958. Kieffer's type specimen came from the foothills of Mt. Kilimanjaro, Tanzania, at 1372 m.

Distribution. Western Cape Province, South Africa to Tanzania.

Nauocladius (Nauocladius) argentiplumus, spec. nov.

Nauocladius (Nauocladius) niveiplumus (Freeman), Saether 1977

This description is based on 5 males and one female, from the Vaal River, Transvaal, originally pinned.

Types. Holotype: ♂, Vaal River, Standerton, Transvaal, South Africa, Chutter 1960 (ZSM). - Paratype: 1 ♀, same date (ZSM).

Adult male (N = 5)

Colour. Head dark brown, frons lighter; palps and antennae light brown, last flagellomere darker, setae colourless, silvery white in live and pinned specimens. Thorax mostly dark brown, anepisternum lighter, legs brown with proximal half of mid and hind femurs slightly darker. Abdomen brown, distal halves of tergites VI and VII lighter.

Wing length. 1.2-1.3 mm.

Head. AR 0.72-0.76; 11 flagellomeres, the end one club-shaped with about 30 short, slightly curved terminal setae shorter than the clubbed end, and numerous, long, fine plume setae on proximal two-thirds (Fig. 15). Setation: Outer verticals 1, inner verticals nil, clypeals 5 or 6; vestigial ocelli present. Palp segments: 23, 35, 48, 71, 92 µm.

Thorax. Setation: Anteprenotals 2, dorsocentrals 7, prealars 1, scutellars 0-2 per side.

Wings. Setation: Brachiolium 1 (seen only on one specimen, the others had nil), R 1 or 2, R₁ nil, R₄₊₅ nil, squama 5.

Legs. LR fore 0.56-0.58, mid 0.55, hind 0.51. No sensillae chaeticae.

Abdomen. Setation of tergites I and III-VII in Fig. 5.

Hypopygium (Fig. 16). Tergite IX with 6 curved setae, lateral tergite IX with 3 setae; anal point with two minute setae at tip; gonostylus slightly squared off terminally.

Adult female (N = 1)

Colour. Head brown, frons lighter, palps and antennae brown, antennal setae colourless, white on pinned specimens. Thorax mostly light brown, scutal stripes separate on yellow background, anepisternum lighter, legs light brown. Abdomen light brown but sternite VIII slightly darker.

Wing length. 1.3 mm.

Head. AR 0.73; 5 flagellomeres, last one with slightly curved setae shorter than flagellomere (Fig. 14). Setation: Outer verticals 1, inner verticals nil, clypeals 6. Vestigial ocelli present. Palp segments: 23, 25, 58, 81, 108 µm.

Thorax. Setation: Anteprenotals 3, dorsocentrals 8, prealars 1, scutellum 1 per side.

Wings. Setation: Brachiolium nil, R 8, R₁ 3 or 4, R₄₊₅ 12 or 14, squama 4.

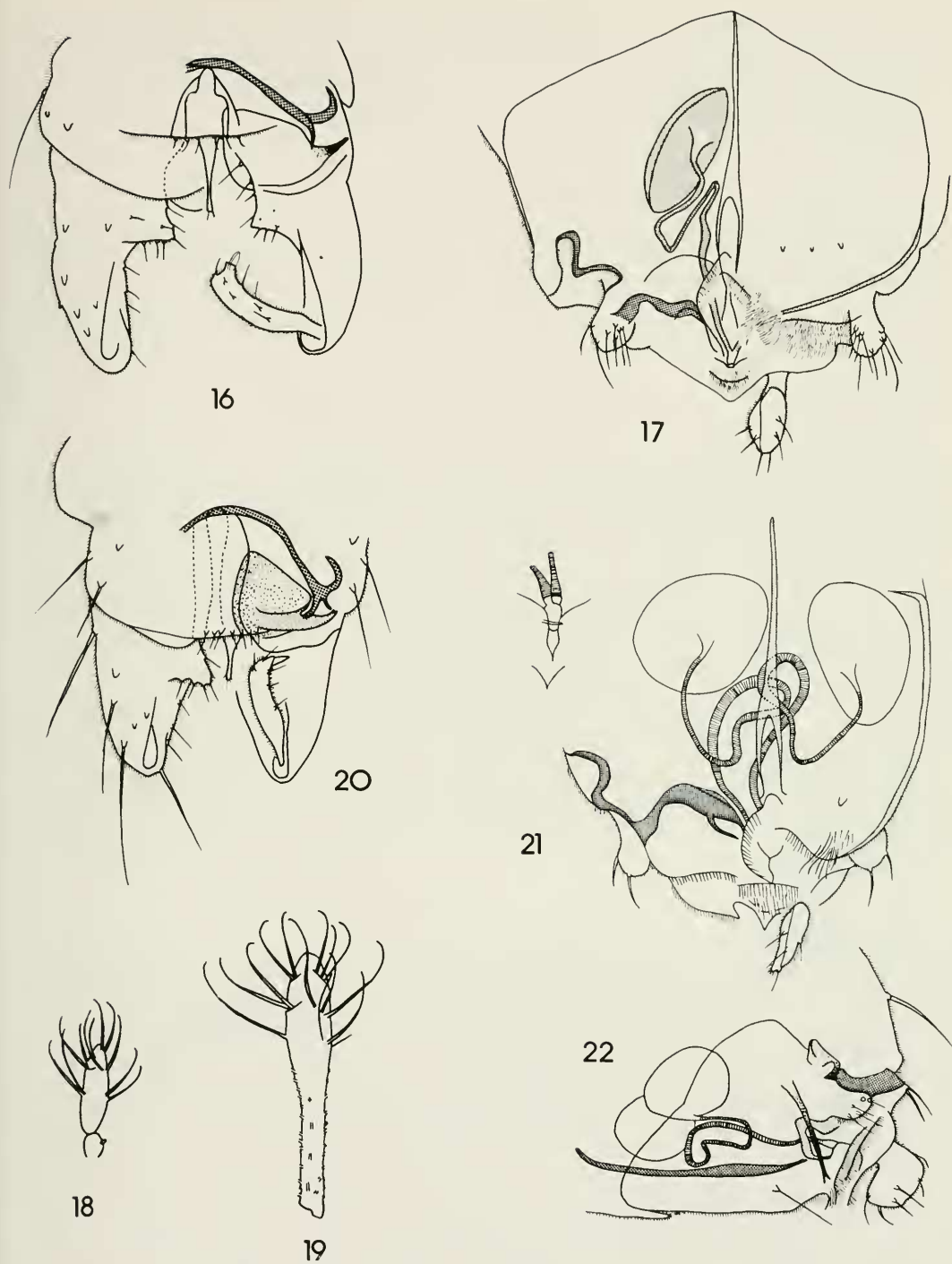
Legs. LR fore 0.55, mid 0.43, hind 0.50; sensillae chaeticae - a few on basal 0.25 of tarsomere 1 of mid leg.

Abdomen. Setation of tergites I and III-VII on Fig. 6.

Genitalia (Fig. 17). Gonopophysis VIII divided into two obtuse lobes with very long microtrichia, dorsomedial and apodeme lobes present (on left of figure); coxosternapodeme narrow and light brown, gonocoxapodeme irregular in shape; protrusions of tergite IX with 3 setae each (not in figure); gonocoxite IX large with 9 or 10 setae, 4 forming a raised ventral clump; segment X normal, postgenital plate rounded with large microtrichia, cerci small 51 µm, 0.6 of length of seminal capsule. Seminal capsules brown (they were damaged by the softening but are probably oval in shape), small funnel-shaped neck ventrally; ducts are convoluted, glandular for their full length and wider in distal half, openings are separate with no bulbs.

Specimens examined. 2 ♂♂, 1 ♀ Vaal River, Standerton, 29° 15'E, 26° 17'S; 2 ♂♂, Vaal River, Standerton - Villiers road, 28° 44'E, 26° 59'S; 1 ♂, Klein Vaal River near its confluence with the vaal, 30° 08'E, 26° 49'S, all Transvaal S. Africa; coll. F. M. Chutter.

Comments. This is undoubtedly the species described by Saether (1977) under *N. (N.) niveiplumus* as his details of the male and female fit with a few minor variations. This species differs from *vitellinus* not only in the antennal structure of both males and females, but also in the fewer setae on tergite IX of the



Figs 16-17. *N. argentiplumus*. 16. Hypopygium. 17. ♀ genitalia.
 Figs 18-22. *N. saetheri*. 18. End flagellomere ♀. 19. End flagellomere ♂. 20. Hypopygium. 21. ♀ genitalia (ventral). 22. ♀ genitalia (lateral).

male, the structure of the gonostylus of the male, which is more squared off terminally, and in details of the female genitalia, such as the thinner coxosternapodeme of VIII, only 3 setae per side on the dorsal tergite of IX and the weaker chitination of IX.

Ecology. From sections of the Vaal River with torrents alternating with long, slow-flowing sections.

Distribution. So far only known from the Transvaal, South Africa.

Nanocladius (Nanocladius) saetheri, spec. nov.

This description is based on 5 males, 2 females, 5 larvae and one pupa from Lake Awasa, Ethiopia. They were preserved in alcohol and mounted in Canada balsam. Association of stages was complete as the pupa contained a pharate male and one of the larvae was a prepupa with thoracic horn.

Types. Holotype: ♂, 10.12.1983, Lake Awasa, Ethiopia (ZSM). - Paratype: 1 ♀, 15.4.1982, Lake Awasa, Ethiopia (ZSM).

Adult male (N = 5)

Wing length: 1.13 mm.

Colour. Head mostly dark brown, frons lighter, palps and antennae light brown, last flagellomere dark, antennal setae white. Thorax scutum, scutellum, and postnotum dark brown, preepisternum brown, anepisternum lighter; legs brown, proximal half of femora of mid and hind legs darker. Abdomen tergites dark brown, lighter patches on distal half of VI and VII. Hypopygium brown.

Head. AR 0.45-0.5, antennae with 13 flagellomeres, the end one club-shaped with about 20 curved terminal setae (Fig. 19), and with a large number of normal plume setae on the basal half. Setation: Outer verticals 1, inner verticals nil, clypeals 6; vestigial ocelli present. Palp segments: 20, 34, 48, 80, 133 μ m.

Thorax. Setation: Anteprenotals nil, dorsocentrals 6 or 7, prealars nil or 1, scutellars nil or 1 per side.

Wings. Setation: Brachiolium 1, R nil, R_1 nil, R_{4+5} nil, squama 1.

Legs. LR fore 0.61, mid 0.38, hind 0.53; sensillae chaeticae nil.

Abdomen. Setal pattern Fig. 7. There is considerable variation from the pattern shown, some specimens having fewer setae in a more symmetrical arrangement, for instance III can have 5 per side, IV 4 per side, V 5 per side and VI 5 per side.

Hypopygium (Fig. 20). Tergite IX has 6 or 7 setae and lateral tergite IX 4 setae, the anal point has 5 or 6 setae terminal and just subterminal; the gonostylus is a fairly narrow (width/length 0.4) with distal end somewhat rounded.

Adult female (N = 1)

Wing length: 0.9 mm.

Colour. Lighter than the male. Head vertex dark brown, the rest lighter, palps and antennae brown, antennal setae white. Thorax scutal stripes dark brown on light brown background, well separated, scutellum and postnotum dark brown, preepisternum brown, anepisternum light brown; legs light brown, proximal half of femora of mid and hind legs darker. Abdomen tergites dark brown, genitalia light brown but sternite VIII darker.

Head. AR 0.7, 5 flagellomeres, last one club-shaped with about 14 curved setae, all shorter than flagellomere (Fig. 18). Setation: Outer verticals 3, inner verticals nil, clypeals 6. Vestigial ocelli not apparent. Palp segments: 21, 23, 35, 51, 115 μ m.

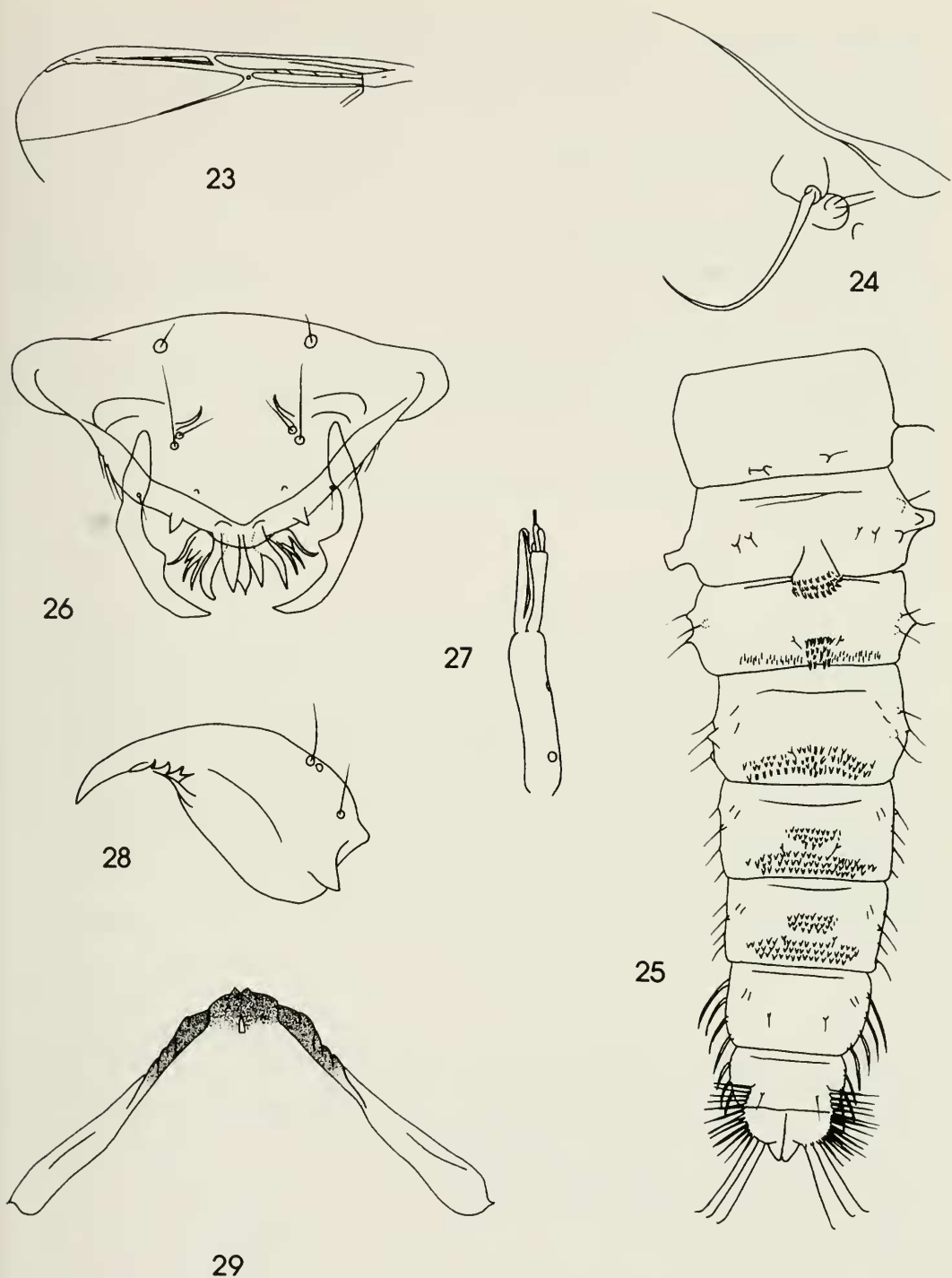
Thorax. Setation: 1 median, 2 lateral anteprenotals (Fig. 2), dorsocentrals 8-9, prealars 1, scutellars 1 per side.

Wings. Costa somewhat thickened near tip so that R_{2+3} and wing membrane are constricted to narrow groove (Fig. 23). Setation: Brachiolium 1, R 3 or 4, R_1 1, R_{4+5} 2, squama 2.

Legs. LR fore 0.45, mid 0.50, hind 0.48. 2 sensillae chaeticae on basal 0.25 of tarsomere 1 of mid leg.

Abdomen. Tergite setation in Fig. 8; there are only 3 setae per side.

Genitalia (Figs. 21-22). Ventrolateral lobes of gonopophysis VII with long microtrichia at the tip, dorsomedial lobe very thin, apodeme lobe present; coxosternapodeme narrow, gonocoxapodeme large and curved; tergite IX strongly chitinated and divided into 2 low lobes with 2 setae each (Fig. 22); gonocoxite IX



Figs 23-29. *N. saetheri*. 23. ♀ wing. 24. Pupa cephalic horn. 25. Pupa abdominal tergites. 26. Larva labrum. 27. Larva antenna. 28. Larva mandible. 29. Larva mentum.

with 5 setae; postgenital plate rounded with long microtrichia, cerci small 34 μm , 0.60 the length of the seminal capsule. Seminal capsules oval and colourless, with small funnel-shaped neck ventrally, ducts convoluted, middle section wider, glandular for full length, opening separately with narrow bulb (Fig. 21).

Pupa (N = 1)

Similar to diagnosis in Coffman et al. (1986).

Length 2.2 mm.

Colour. Light yellow preserved in alcohol.

Cephalothorax. Frontal setae long, on tubercles on frontal apotome, 2 large postorbitals 2 median antepnotals on tubercles, 1 lateral antepnotal, thoracic horn (Fig. 24) long and tapering with no spinules, 4 dorsocentrals, 3rd small, prealars absent.

Abdomen (Fig. 25). No shagreen discernible, tergite II with 3 rows of posterior hooklets on a distal protruberance, tergite III with posterior row of hooklets interrupted in the centre by a patch of spines; tergite IV with a broad posterior patch of spines, tergites V and VI with both median and posterior patches of spines; tergites VII and VIII without spines. Pedes spurii A present on sternites V and VI, pedes spurii B on segment II.

Abdominal setation as in Fig. 25, LS setae of VII and VIII and anal fringe flattened. Anal lobe with 3 equally long macrosetae, longer than lobe, male genital sacs overreaching anal lobe.

Larva (N = 5)

Similar to diagnosis in Cranston et al. (1983).

Length. 2.3-2.6 mm. Head capsule length 240-259 μm (N = 4).

Colour. Head yellowish, teeth of mandible and mentum dark brown and thin dark occipital rim. Body yellowish (preserved), claws yellow.

Antennae (Fig. 27). With 5 segments, segment 5 very small, AR 0.78, ring organ on basal 0.25 of segment 1; blade reaches to end of segment 3, accessory blade almost as long as blade; Lauterborn organs small.

Labrum (Fig. 26). S I appears to be absent or reduced to a scar, S II and III weak and simple, chaetae simple; pecten epipharynx of three equal pointed spines; 1 pair of chaetulae basales present and only 4 pairs of chaetulae laterales could be discerned; premandible with simple apical tooth.

Mandible (Fig. 28). Apical tooth much longer than combined with of 3 inner teeth, seta subdentalis pointed, no seta interna.

Mentum (Fig. 29). Median tooth broad and partially double, 6 pairs of lateral teeth, the first 2 broad and flat, the rest pointed; ventromedial plate long, caudolateral apex rounded with point.

Maxilla. Similar to Fig. 9.45 F of Cranston et al. (1983) but chaetulae of palpiger fairly large and subtriangular, lacinal chaetas simple, seta maxillaris simple.

Body. Anterior and posterior claws all smooth, anal tubercles shorter than the post parapods, tips rounded.

Specimens examined. 5♂♂, 2♀♀, 1 pupa and 5 larvae from Lake Awasa, Ethiopian Rift Valley, coll. A. D. H. and Tilahun Kibret, 1982-1984. Larvae were also seen from nearby Lake Ziwai, coll. C. Tudorancea, 1984-1985.

Comments. The pupae key out to the *bicolor* group and the larvae also, based on the claws; the larval AR is much smaller than that of species reported in Cranston et al. (1983).

Ecology. The larvae came from the marginal vegetation beds of Lakes Awasa and Ziwai. Dejoux (1983) reports a possible *Nanocladius* larva from Lake Chad.

Distribution. Lakes in the Ethiopian Rift Valley.

Nanocladius (*Nanocladius*) *spec. A*

Nanocladius (*Nanocladius*) *spec. ? vitellinus*, Saether 1977.

Saether described this species from a female from Khartoum, Sudan, which was included in the material labelled as *N. (N.) vitellinus* Kieffer by Freeman in the British Museum (Natural History). It belongs to Group A, species with white antennal setae, but not any to the species described above, as it has only 4 flagellomeres.

It is a small female (wing length 0.87 mm) with an AR of 0.57. The end flagellomere has slightly curved setae, some of which appear to be almost as long as the flagellomere; there are 2 sensillae chaeticae on the basal 0.25 of tarsomere 1 of the mid leg. The genitalia appear to be very similar to those of *N. saetheri*.

The specimen was collected at a light by D. J. Lewis, 53/19/9, and probably emerged from the lower, warmer reaches of the Nile.

Group B: Species with brown antennal setae in males and females

Nanocladius (*Nanocladius*) *jannae* Lehmann, 1979

Nanocladius (*Nanocladius*) *jannae* Lehmann, 1979

This description was based on 2 males from Zaire and one from Ethiopia.

Adult male (N = 3)

Length of wing. 1.1 mm.

Colour. Mostly brown to dark brown. Legs brown, femurs a uniform brown.

Head. AR 0.29, 13 flagellomeres with brown setae, last flagellomere (Fig. 31) with about 20 terminal setae, only slightly curved at tips and one normal setae near base. Setation: Outer verticals 1, inner verticals nil, clypeals 4; vestigial ocelli present. Palp segments: 14, 24, 36, 60, 89 μ m.

Thorax. Setation: Anteprenotals 1 or 2, dorsocentrals 3, prealars, 1, scutellars 1 per side.

Wings. Setation: Brachiolium 1, R nil, R_1 nil, R_{4+5} nil, squama 1.

Legs. LR for 0.55 mid 0.40, hind 0.56. No sensillae chaeticae.

Abdomen. Setal patterns as in Lehmann, most tergites with only 3 setae per side.

Hypopygium. As in Lehmann, tergite IX with 4 or 5 setae and two dorsolateral setae, anal point with a few minute terminal setae; gonocoxite with narrow dorsomedial ridges with no microtrichia. General shape rather like *N. acutus* (Fig. 38) but gonocoxite lobe usually less acute and gonostylus somewhat broader with tip more rounded.

Adult female (N = 2)

Lehmann's description is amplified as follows.

Length of wing. 1.0 mm.

Colour. Similar to male but lighter.

Head. AR 0.60, 5 flagellomeres, last flagellomere (Fig. 30) with curved terminal setae not much more than 1.25 times the length of the segment, penultimate flagellomere with 2 thin setae, usually on one side. Setation: Outer verticals 1 or 2, inner verticals nil, clypeals 4. Vestigial ocelli present. Palp segments: 17, 31, 46, 62, 96 μ m.

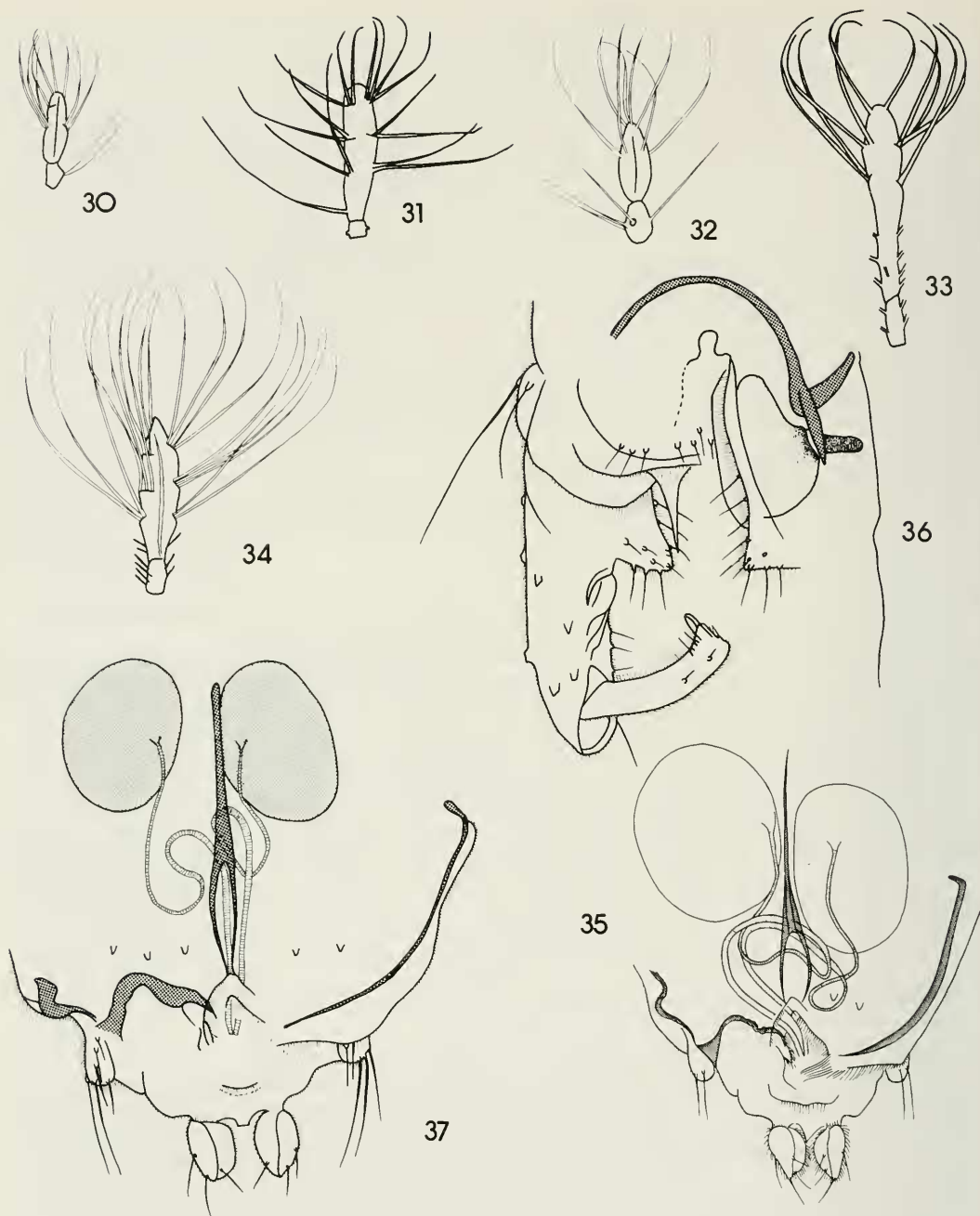
Thorax. Setation: Medial anteprenotals 1, lateral anteprenotals 2 (Fig. 1), dorsocentrals 3, prealars 1, scutellum 1 per side.

Wings. Setation: R 1 or 2, R_1 nil, R_{4+5} 1 or 2 on produced tip, squama 1.

Legs. LR fore 0.52, mid 0.39, hind 0.50. No sensillae chaeticae.

Abdomen. Setal pattern similar to male.

Genitalia (Fig. 35). Lobes of gonopophysis VIII with very long microtrichia on medio-posterior tip, dorsomedial lobe and weak apodeme lobe present; coxosternapodeme well developed, gonocoxapodeme narrow, curved; tergite IX with 2 or 3 setae on paired protrusions; gonocoxite X with 4 setae, postgenital plate not rounded, almost straight with slight central protrusion; cerci small, 34 μ m, 0.4 of seminal capsules which are large, 82 μ m, and colourless, small funnel-shaped necks ventrally; ducts are coiled, broader distally, separate openings with no obvious bulbs.



Figs 30-34. End flagellomere. 30. *N. jamae* ♀. 31. *N. jamae* ♂. 32. *N. ortsi* ♀. 33. *N. ortsi* ♂. 34. *N. acutus* ♂.
 Fig. 35. *N. jamae*. ♀ genitalia.
 Fig. 36. *N. ortsi*. Hypopygium.
 Fig. 37. *N. ortsi*. ♀ genitalia.

Pupa

Lehmann describes the pupa; the thoracic horn is short, pointed with spines on the distal half and long terminal spines. Abdominal tergites 5 and 6 have small central patches of spines and distal rows of large spines; the anal macrosetae are strongly curved inwards.

Larva

Unknown

Specimens examined. ♂♂: 2 from Kalengo, Zaire, 72/9/16 and 72/10/22, coll. J. Lehmann; 1 from the Wabe Shebele River, 2500 m, Station ET. 30, 84/1/24, coll. A. D. H. ♀♀: 2 from Kalengo, Zaire, 72/9/22 and 72/11/20, coll. J. Lehmann.

Comments. *N. (N.) jannae* may eventually fall as a synonym of *Nanocladius (N.) brunneus* Freeman (Freeman 1956), which has an AR of about 3, and the terminal setae of the male antennae are "only slightly curved".

Ecology. All these specimens came from fast-flowing streams in the mountains, *N. (N.) brunneus* was found in a similar fast-flowing river in South Africa. However, the rarity of larvae in the Ethiopian river samples, taken from stony torrents, indicates that the real microhabitat was not being sampled. They could be living in quieter spots at the edge of the stream.

Distribution. Kivu District, Zaire, to the Ethiopian Highlands. *N. (N.) brunneus*: Western Cape Province, South Africa.

Nanocladius (Nanocladius) ortsi Lehmann, 1979

Nanocladius (Nanocladius) ortsi Lehmann, 1979.

Males and females were associated, as pharate specimens of both were found in pupae with the same structure by Lehmann (1979). The following description amplifies Lehmann's description.

Adult male (N = 4)

Length of wing. 1.44 mm.

Colour. Mostly brown to dark brown, antennal setae brown, legs brown, femora uniform brown.

Head. AR 0.38, 13 antennomeres, last antennomere with about 12 long and strongly curved terminal setae (Fig. 33), the longest slightly longer than the antennomere, 8 or more normal setae on the base of the antennomere. Setation: Outer verticals 1, inner verticals nil, clypeals 6. Vestigial ocelli present. Palp segments: 22, 46, 62, 89, 120 μ m.

Thorax. Setation: Anteprenotals nil, dorsocentrals 3-5, prealars 1, scutellars 1 per side.

Wings. Setation: R nil, R_1 nil, R_{4+5} nil, squama 1.

Legs. LR fore 0.60, mid 0.50, hind 0.53. No sensillae chaeticae.

Abdomen. Setal pattern as in Lehmann; most of the tergites have 4 setae per side.

Hypopygium (Fig. 36). Lehmann did not illustrate this so it is shown here. Tergite IX with 6 or 7 setae, lateral tergite IX with 3 setae. No setae could be detected on the tip of the anal point which comes to a fine point. Gonocoxite with narrow, dorsomedial ridges with no microtrichia.

Adult female (N = 2)

Length of wing. 1.26 mm.

Colour. Similar to male but lighter.

Head. AR 0.56, 5 flagellomeres, last flagellomere with long, curved, apical setae 1.5-2 times its length, penultimate flagellomere with 4 robust setae (Fig. 32). Setation: Outer verticals 2, inner verticals nil, clypeals 6. Vestigial ocelli present. Palp segments: 29, 43, 65, 86, 136 μ m.

Thorax. Setation: 1 medial, 2 lateral anteprenotals, dorsocentrals 7, prealars 1, scutellum 1 per side.

Wings. Setation: R 6, R_1 1, R_{4+5} 1 at tip, squama 2.

Legs. LR for 0.56, mid 0.46, hind 0.61. No sensillae chaeticae.

Abdomen. Setal pattern similar to the male.

Genitalia (Fig. 37). Long microtrichia at the tip of gonopophysis VIII, small dorsomesal and apodeme lobes present; coxosternapodeme very narrow, gonocoxapodeme broad and curved (difficult to discern in teneral female); protrusions of tergite IX with 3 setae each; gonocoxite IX with 6 setae; postgenital plate slightly convex with long microtrichia, cerci small, 39 μm , 0.5 length of seminal capsule which is oval and brown, with small funnel-shaped necks ventrally, ducts convoluted, distal section wider, glandular for full length, no bulbs, separate openings.

Pupa

Thoracic horn long and pointed with small teeth, central spine patches on abdominal tergites V and VI, posterior fringe of long teeth on V but not on VI, anal macrosetae not curved inwards (Lehmann 1979).

Larva

Unknown.

Specimens examined. Zaire: 1♂ and 2♀♀ from Kalengo, 72/11/20, 72/9/15, 72/10/23, coll. J. Lehmann; Ethiopia: 2♂♂ from the Zenbaba River, Station ET. 18, at 2850 m, 84.1.12.; 1♂ from the Abo-Kebene, Station ET. 2 C, 84.11.8, at 2450 m, coll. A. D. H.

Comments. Males of *N. ortsi* can be distinguished easily from those of *jannae* by means of the setation of the abdominal tergites, the AR and the structure of the last flagellomere, females by the structure of their antennae, the presence of 7 dorsocentral setae and the broad gonocoxapodeme.

Ecology. See remarks for *N. (N.) jannae*.

Distribution. Kivu District, Zaire, and the Ethiopian Highlands.

Nanocladius (Nanocladius) acutus Lehmann, 1981

Nanocladius (Nanocladius) acutus Lehmann, 1981.

Lehmann gives a very short description of the male of this species and separates it from *jannae* and *ortsi* on the characters of the pupa. Nevertheless, the males are also distinguishable from these two species on adult characters and a fuller description is given here based on 3 males collected by Lehmann.

Adult male (N = 3)

Length of wing. 0.8 mm.

Colour. Head dark brown, antennae and palps brown. Thorax mainly dark brown, legs plain brown, Abdomen tergites brown. Hypopygium brown.

Head. AR 0.34, 13 flagellomeres last one with about 20 long, curved terminal setae, some 1.5 times its length, and with a few normal setae on its base (Fig. 34). Setation: Outer verticals 1, inner verticals nil, clypeals 4. Vestigial ocelli not apparent. Palp segments: 14, 26, 50, 82, 109 μm .

Thorax. Lateral anteprenotals 2, dorsocentrals 3, prealars 1, scutellars 1 per side.

Wing. Setation: R nil, R₁ nil, R4+5 nil, squama 1 (?).

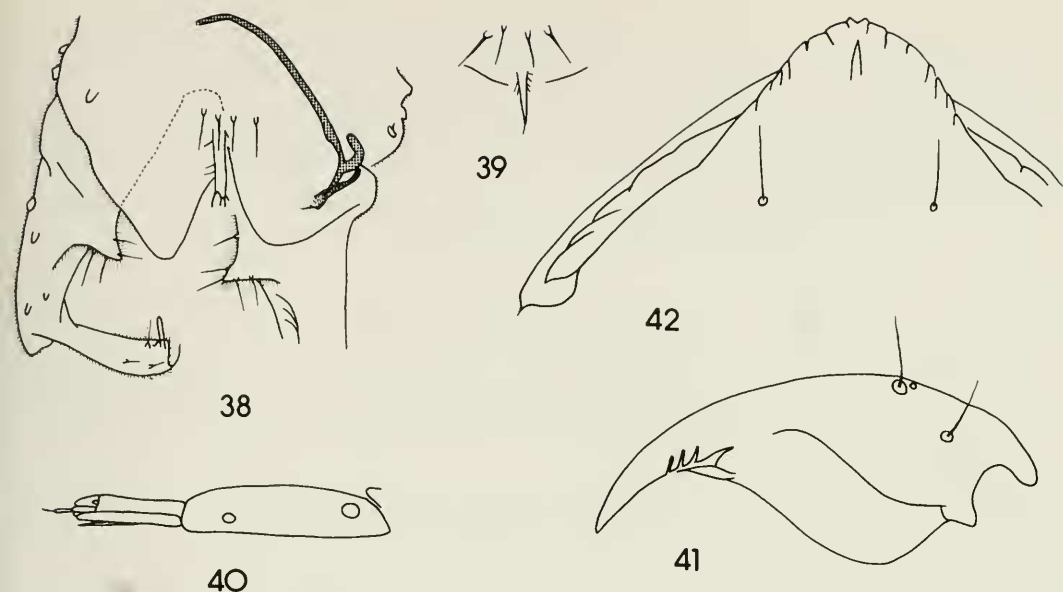
Legs LR for 0.56, mid 0.43, hind 0.54. No sensillae chaeticae.

Abdomen. Setal pattern similar to that of *N. jannae*.

Hypopygium (Fig. 38). Tergite X with 4 setae, lateral tergite X 3 setae, anal point with microtrichia on sides and tip, one specimen was blunt with several microtrichia at or near the tip and another pointed with one at the tip (Fig. 39). The gonocoxal lobes are acute and the gonostylus almost square-ended.

Specimens examined. 3♂♂ from a stream near Kisangani, Zaire, 75/3/14, 75/3/19, 75/4/18, coll. J. Lehmann.

Ecology. Adults were caught in a plastic tent over a fast-flowing stream; larvae which, presumably, could have belonged to this species were found in aquatic moss in fast current, in gravelly stones and



Figs 38-39. *N. acutus*. 38. Hypopygium. 39. Anal point variation.
Figs 40-42. *N. spec. larva 1*. 40. Antenna. 41. Mandible. 42. Mentum.

allochthonous organic material.

Distribution. In the region of Kisangani, Central Zaire.

Nanocladius (Nanocladius) spec. Larva 1

Four larvae were collected from Ethiopian mountain rivers all which appear to be of the same species. It is possible that they belong to one of the two preceding species.

Similar to diagnosis in Cranston et al. (1983).

Length. 2.7-3.1 mm, length of head capsule 259-288 μm .

Colour. Head yellowish, teeth of mandible and mentum light brown. Body yellowish, claws yellow.

Antennae (Fig. 40). With 5 segments, segment 5 very small and narrow, AR 0.62, ring organ on basal 0.25 of segment 1; blade reaches almost to end of segment 3, accessory blade almost as long as blade; Lauterborn organs comparatively large.

Labrum. Similar to that of *N. saetheri*, S setae very small but S1 present, chaetulae basales and laterales longer than pointed scales, premaxilla with simple apical tooth.

Mandible (Fig. 41). Apical tooth much longer than combined width of 3 inner teeth, seta subdentalis broad but pointed, no seta interna.

Mentum (Fig. 42). Median tooth broad and partially double, 6 pairs of lateral teeth, the first 2 pairs broad and flat, the rest pointed, ventromedial plate long, caudolateral apex rounded with point.

Maxilla. Similar to that of *N. saetheri*.

Body. Anterior claws pectinate, some smooth ones on base of parapod, posterior claws all smooth; anal tubercles long and pointed (about 288 μm long), longer than post parapods.

Specimens examined. 2 from small tributary of Dima River, Station ET. 10, 2850 m, 83/11/20; 1 from Sekord River, Station ET. 14, 2500 m, 83/12/28; 1 from Dadi River, station ET 1, 2450 m, 83/12/28; coll. A. D. H.

Ecology. See remarks for *N. (N.) jannae*.

Distribution. Ethiopian Highlands.

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References

- Coffman, W. P., P. S. Cranston, D. R. Oliver & O. A. Saether 1986. The pupae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region - keys and diagnoses. In T. Wiederholm (Ed.): Chironomidae of the Holarctic region. Part 2. Pupae - Ent. Scand. Suppl. 28: 147-296
- Cranston, P. S., D. R. Oliver & O. A. Saether 1983. The larvae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region - keys and diagnoses. In T. Wiederholm (Ed.): Chironomidae of the Holarctic region. Part I. Larvae - Ent. Scand. Suppl. 19: 149-291
- Dejoux, C. 1983. The fauna associated with aquatic vegetation. In J.-P. Carmouze, J.-R. Durand & C. L  veque (Eds.): Lake Chad, ecology and productivity of a shallow tropical ecosystem, pp 273-292. - Monogr. Biol. 53, Dr. W. Junk Publishers, The Hague
- Fittkau, E.-J. & J. Lehmann 1970. Revision der Gattung *Microcricotopus* Thien. u. Harn. (Dipt., Chironomidae). - Int. Rev. Ges. Hydrobiol. 55: 391-402
- Freeman, P. 1953. Chironomidae from western Cape Province - II. - Proc. r. Entomol. Soc. Lond. (B) 22: 201-213
- 1956. A study of the Chironomidae (Diptera) of Africa south of the Sahara, Part 2. - Bull. Brit. Mus. (Nat. Hist.) Ent. 4: 287-368
- 1960. (Personal communication)
- & P. S. Cranston 1980. Family Chironomidae. In R. W. Crosskey (Ed.): Catalogue of the Diptera of the Afro-tropical Region: 175-202. - London: British Museum (Natural History)
- Harrison, A. D. & H. B. N. Hynes 1988. Benthic fauna of Ethiopian mountain streams and rivers. - Arch. Hydrobiol. Suppl. 81: 1-36
- Kieffer, J. J. 1913. I. Chironomidae et Cecidomyiidae, pp 1-43. In C. A. Alluaud et R. Jeannel (Eds.): Voyage de Ch. Alluaud et R. Jeannel en Afrique orientale. Insectes Dipt  res 5. - Paris
- Lehmann, J. 1979. Chironomidae (Diptera) aus Flie  gew  ssern Zentralafrikas (Systematik,   kologie, Verbreitung und Produktionsbiologie), Teil I: Kivu-Gebiet, Ostzaire. - Spixiana, Suppl. 3: 1-144
- 1981. Chironomidae (Diptera) aus Flie  gew  ssern Zentralafrikas, Teil II: Die Region um Kisangani, Zentralzaire. - Spixiana Suppl. 5: 1-85
- Saether, O. A. 1977. Taxonomic studies on Chironomidae: *Nanocladius*, *Pseudochironomus*, and the *Harnischia* complex. - Bull. Fish. Res. Board. Canada 196: 1-143
- Scott, K. M. F. 1958. Hydrobiological studies on the Great Berg River, Western Cape Province, Part 3. The Chironomidae. - Trans. r. Soc. Sth. Afr. 35: 277-298